

Name(s) of Risk Team Members: Ralph Brown and D. Passarello			Point Value → Parameter ↓		1		2		3		4		5		
Area/Facility Description Title: Collider-Accelerator Area/Facility # (if applicable): Area-Wide FRA 12-06			Occupancy or Use		≤once/year		≤once/month		≤once/week		≤once/shift		>once/shift		
Area/Facility Description: STAR Area-Wide			Severity		First Aid Only		Medical Treatment		Lost Time		Partial Disability		Death or Permanent Disability		
			Likelihood		Extremely Unlikely		Unlikely		Possible		Probable		Multiple		
Approved by: <i>E. Lessard</i> Date: 5/5/2006 Rev.#: 0									Comments:						
					Reason for Revision (if applicable):										
					Before Additional Controls								After Additional Controls		
Physical Item or Activity	Hazard(s)	Control(s)	Occupancy A	Severity B	Likelihood C	Risk* AxBxC	Control(s) Added to Reduce Risk				Occupancy A	Severity B	Likelihood C	Risk* AxBxC	% Risk Reduction
Primary Beam	High hazard ionizing radiation	ACS; PASS; postings; crash buttons and chords; C-AD area classification; shielding; dosimeters; training; RSC reviews	1	5	2	10									
General Area Radiation Residual Radiation, External Radiation	Ionizing radiation	Postings, training, shielding, RCD surveys, RCD oversight, RWP, work planning	4	1	2	8									
Hydraulics	Being struck by an object, due to a pressure release	Design reviews, ESRC/ASSRC reviews, pressure testing, work planning, PPE, training, procedures, posting labeling, LOTO to move detector	3	4	2	24									
Hydraulics	Falls on same level	Work planning, Tier 1 inspections	3	4	3	36									
Hydraulics	Fire	Design reviews, ESRC/ASSRC reviews, proof testing, LOTO, work planning, PPE, training, Fire/Rescue Group response, oil temperature interlock	3	4	2	24									
Electrical Equipment & Power Supplies BNL Class A & B <250 V AC; <1000 V DC	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures; PPE as per NFPA 70E	5	3	2	30									
Electrical Equipment & Power Supplies BNL Class C <600 V AC; <6000 V DC	Arc blast; burn	Procedures, training, PPE as per NFPA 70E	3	4	2	24									

Electrical Equipment & Power Supplies BNL Class C <600 V AC; <6000 V DC	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures; two-person rule for hot work; PPE as per NFPA 70E	2	4	2	16					
Electrical Equipment & Power Supplies BNL Class D >600 V AC; >6000 V DC	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures; safety watch for hot work; PPE as per NFPA 70E	2	4	2	16					
Electrical Equipment & Power Supplies BNL Class D >600 V AC; >6000 V DC	Arc blast; burn	Procedures, training, PPE as per NFPA 70E	2	4	2	16					
Electrical Disconnects And Switches	Arc blast; burn	Procedures, training, PPE as per NFPA 70E	2	3	3	18					
Electrical Disconnects And Switches	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures; two-person rule for hot work; PPE as per NFPA 70E	2	4	2	16					
Electrical Circuit Breaker & Switch Operation by Non-Electrical Workers < 600 VAC	Shock or electrocution	Training and the following posting: Equipment has been evaluated for arc-flash Fed from 30kVA or less transformer PPE required to throw circuit breakers safety glasses All work with covers off: Hazard risk cat. 1 PPE	1	3	2	6					
Motor Control Centers; Panels And Wall Sockets	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; grounding standards; PPE as per NFPA 70E	4	4	2	32					
Motor Control Centers; Panels And Wall Sockets	Arc blast; burn	PPE as per NFPA 70E; training; procedures	4	3	2	24					

Electrical Powered Hand Tools	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; procedures; training; labeling; work planning; GFCI; grounding standards; double insulation; PPE as per NFPA 70E	4	3	2	24					
Extension Chords; Temporary Wiring And Power Strips	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; qualified electricians and technicians; GFCI; grounding standards; PPE as per NFPA 70E	4	3	2	24					
Vacuum	Ear damage	Postings; PPE; maintenance; training; work planning; ASSRC reviews; procedures; Tier 1 inspections; Chief ME reviews; vacuum windows covered during handling; use of industry standards; design reviews	3	4	2	24					
Vacuum	Being struck by an object such as flying debris	Postings; PPE; maintenance; training; work planning; ASSRC reviews; procedures; Tier 1 inspections; Chief ME reviews; vacuum windows covered during handling; ; use of industry standards; design reviews	3	4	2	24					
Magnetic Field	Adverse mechanical force exerted on ferromagnetic objects and or to electronic/medical implants.	Barriers; warning systems; postings; training; ESRC review; work planning; procedures; Tier 1 inspections; magnetic safety reviews; medical exams; inspection of magnet prior to startup	1	4	2	8					
Flammable /Explosive Gases	Fire, smoke and heat	Fire detection & suppression systems; procedures; training; equipment protective systems; ASSRC/ESRC reviews; Fire Hazards Analysis; Tier 1 inspections; maintenance; emergency procedures; BNL Fire Rescue; ASE requirements; volume controls; segregation controls; labeling; area posting; gas detection interlock systems; annual certification of fire alarm system	4	4	2	32					
Gasses	Oxygen deficiency	ODH analyses; ODH controls; training; remote/local audible/visible alarms; emergency response; work planning; MSDS; postings; flammable gas alarms; cylinder storage controls; cylinder labels; gas volume limits; inspections; cylinder hydrostatic testing; flow limiting devices; semi-annual calibration of ODH sensors	4	5	2	40					
Lighting	Being struck against an object, such as a carpenter walking into a door frame due to poor lighting	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	3	2	3	18					
Lighting	Falls on same level	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	3	3	3	27					
Lighting	Being struck by an object due to a material handling mishaps	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	2	3	3	18					
Material Handling Equipment	Falls to lower level, such as falling from a ladder or over a railing	Training, work planning, inspections, independent PE inspections and approval of equipment, fall protection training, approved scaffolding and platforms, approved fall protection harnesses, Tier 1 inspections, PPE, PE maintenance	3	4	3	36					

Material Handling	Being struck by an object due to improperly secured material or loss of control	Work planning; equipment specific training; work area barricades and controls; PPE; clamps; straps; vices; fixtures	3	3	3	27						
Chemical Handling	Eye exposure	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections; fire-proof locker for storage	3	4	2	24						
Chemicals	Inhalation exposure	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections	3	3	2	18						
Chemicals	Fire; explosions	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections	3	2	2	12						
Manual Material Handling	Bodily reaction – injuries resulting from bending, climbing, loss of balance and slipping without falling	Gloves; hardhat; use of handcarts and dollies; training; non-slip safety shoes	4	3	3	36						
Remotely Operated Equipment	Personnel entanglement in mechanisms.	Postings; barriers; guards; maintenance; training; work planning; procedures; Tier 1 inspections	2	4	2	16						
Use Of Hand Tools	Being struck by an object, such as flying chips	PPE; training; maintenance; Tier 1 inspections; UL listed equipment; pre-inspections	4	2	3	24						
Use Of Hand Tools	Being struck against an object, such as a sharp surface	PPE; training; guarding	4	2	3	24						
Use Of Hand Tools	Becoming caught in or compressed by equipment	Equipment specific training; guarding; PPE; postings	4	2	3	24						
Machining Materials	Becoming caught in or compressed by equipment	Equipment specific training; machine guards; PPE; postings; maintenance; Tier 1 inspections	2	3	3	18						
Machining Materials	Being struck by an object, such as flying chips or debris	Equipment specific training; machine guards; PPE; postings; maintenance; Tier 1 inspections	2	3	3	18						
Machining Materials	Non-rad airborne particulates	PPE; maintenance; work planning	2	1	2	4						
Walking – Working Surfaces	Falls on same level	PPE; Tier 1; work planning; P.E. scheduled maintenance; internal and external inspections; posting; labeling; training; barriers; communication; lessons learned; safety checklist: Walking and Working Surfaces	5	4	2	40						
Work At Heights	Falls to lower level, such as falling from a ladder or over a railing	Postings; barriers; fall protection; maintenance; training; work planning; procedures; Tier 1 inspections; PPE; approved scaffolding and platforms; approved ladders; anti-slip surfaces	3	5	2	30						

Working Environment	Poor air quality; mold	HVAC; facility maintenance; Tier 1 inspections	5	2	2	20					
Water	Being struck by an object due to a pressure release	Postings; maintenance; PPE; training; work planning; ASSRC and ESRC reviews; procedures; Tier 1 inspections; PLC monitoring and interlocks; leak detection systems	4	1	3	12					
Tours	Internal or external radiation	Postings; trained escorts; training waiver; BNL minors policy	3	1	2	6					
Transformer And Switch Yards	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; installations comply with applicable codes; procedures; training; LOTO; qualified electricians; postings; locked areas; work planning; grounding standards; emergency procedures; grounding before work start; PPE as per NFPA 70E	2	5	2	20					
Transformer And Switch Yards	Arc blast	PPE as per NFPA 70E; procedures; training; qualified electricians	2	4	2	16					
Standby Generators	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; grounding standards; emergency procedures; PPE as per NFPA 70E	2	5	2	20					
Standby Generators	Noise	Hearing protection	2	4	2	16					
Radioactive Sources	Internal or external radiation	Training; BNL and C-AD source custodians; source inventory; shielding; locked boxes; leak checks; posting; dosimeters	2	1	2	4					
Pressurized Systems Compressed Air	Being struck by an object due to a pressure release	Postings; PPE; preventive maintenance; training; work planning; ESRC reviews; procedures; interlock systems; certification/testing of pressure related equipment; Tier 1 inspections; LOTO; C-AD Chief ME reviews; codes and standards usage	2	2	2	8					
Noise	Hearing loss	Training; hearing protection; noise surveys; procedures; postings; medicals; engineered noise reduction; work planning	2	4	2	16					
Egress	Impaired egress	Tier 1; work planning; skill of craft; P.E. scheduled maintenance; internal and external inspections; posting; labeling; training; barriers; communication; life safety codes; emergency preparedness	5	3	3	45					
Cryogenic	Being struck by an object due to a pressure release	Postings; maintenance; training; work planning; Cryogenic Safety Committee /ASSRC reviews; procedures; PPE; Tier one inspection; pressure testing	4	2	2	16					
Cryogenic	Contact with temperature – extremes that result in such injuries frost bite or burns	Postings; maintenance; training; work planning; Cryogenic Safety Committee /ASSRC reviews; procedures; PPE; Tier 1 inspection	4	3	2	24					
Confined Spaces	Entrapment	Barriers; postings; training; Confined Spaces Permits; work planning; procedures; Tier 1 inspections	1	3	2	6					

Computer And Office Machine Usage	Repetitive motion resulting in muscular-skeletal injury	BNL SHSD ergonomic reviews; training; use of ergonomically designed equipment	5	3	3	45					
Batteries/UPS	Molten spray	PPE as per NFPA 70E; procedures; training	4	2	2	16					
Limited Access Areas	Impaired egress	Tier 1; work planning; skill of craft; training; barriers	2	1	3	6					
Lasers	Eye damage	Barriers; interlock systems; postings; training; LSO review; work planning; PPE; procedures; Tier 1 inspections; warning systems; medical eye exams	2	4	3	24					
Further Description of Controls Added to Reduce Risk:											
*Risk:	0 to 20	21 to 40	41-60				61 to 80			81 or greater	
	Negligible	Acceptable	Moderate				Substantial			Intolerable	